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Title: U1A.03 NDSE Detector Design Review

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U1A.03 NDSE DETECTOR DESIGN REVIEW

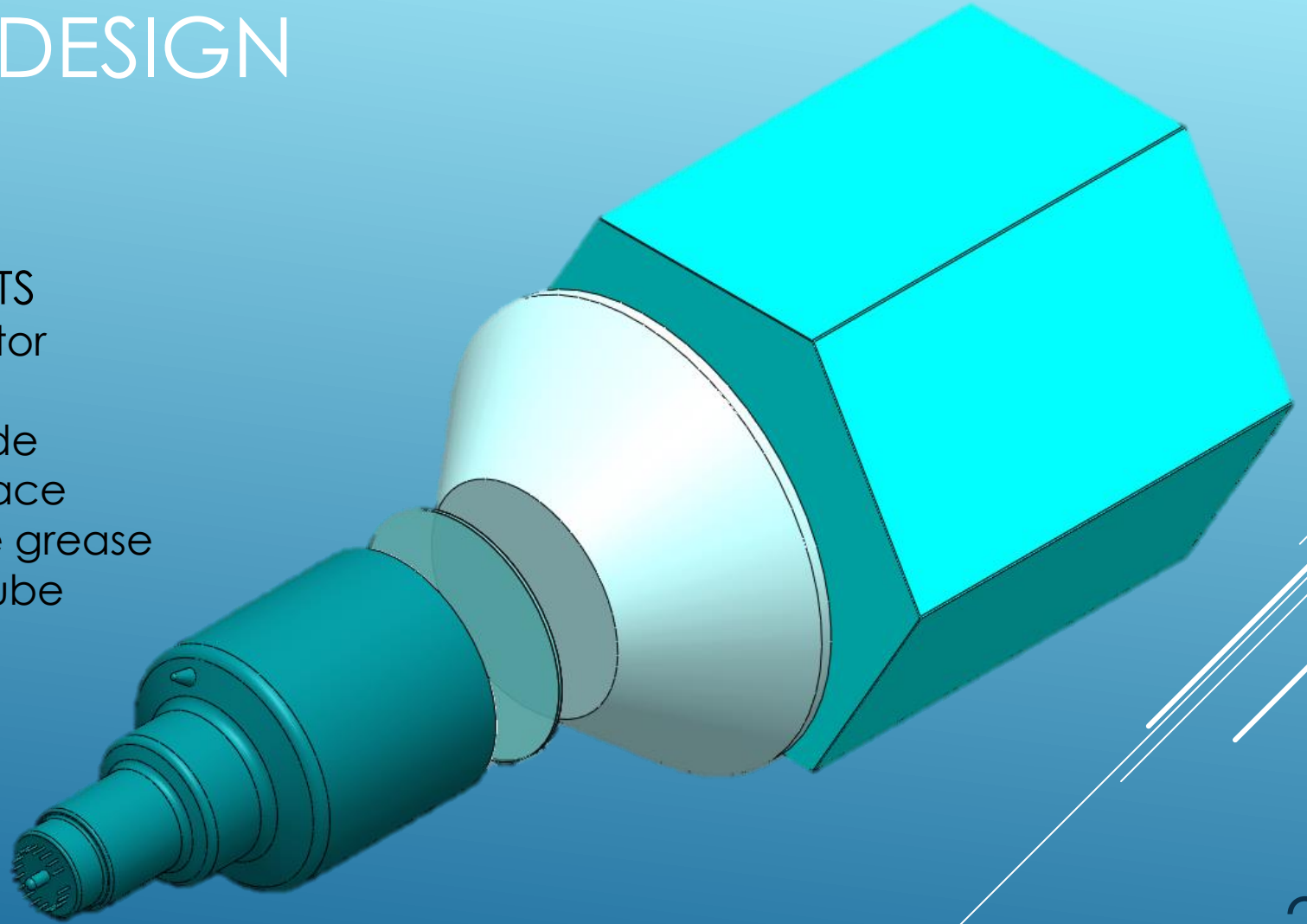
- PIXEL HOUSING DESIGN
- DETECTOR WALL DESIGN

Peter D Pazuchanics
LANL P-23 Group
05/05/2020

PIXEL HOUSING DESIGN

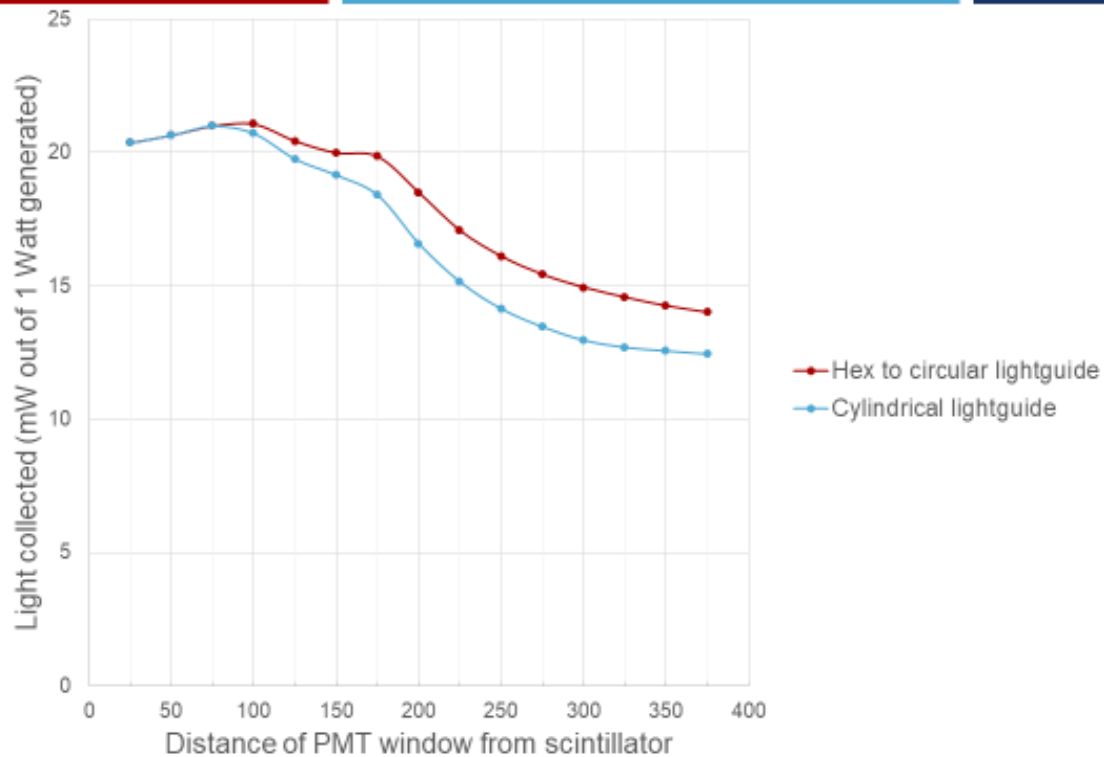
SELECTED COMPONENTS

- EJ-230/299-49 Plastic Scintillator
- EJ-500 Optical Cement
- BC-800 UVT Acrylic Light Guide
- EJ-560 Silicone Optical Interface
- EJ-550 Optical grade silicone grease
- ADIT D798B Photomultiplier Tube

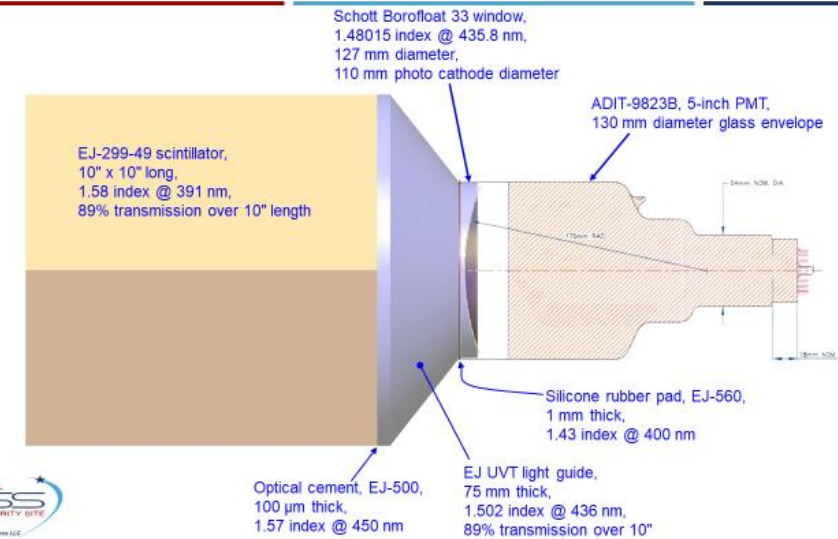


PIXEL HOUSING DESIGN

Evaluating light guide efficiencies versus PMMA length



Gamma-ray detector geometry



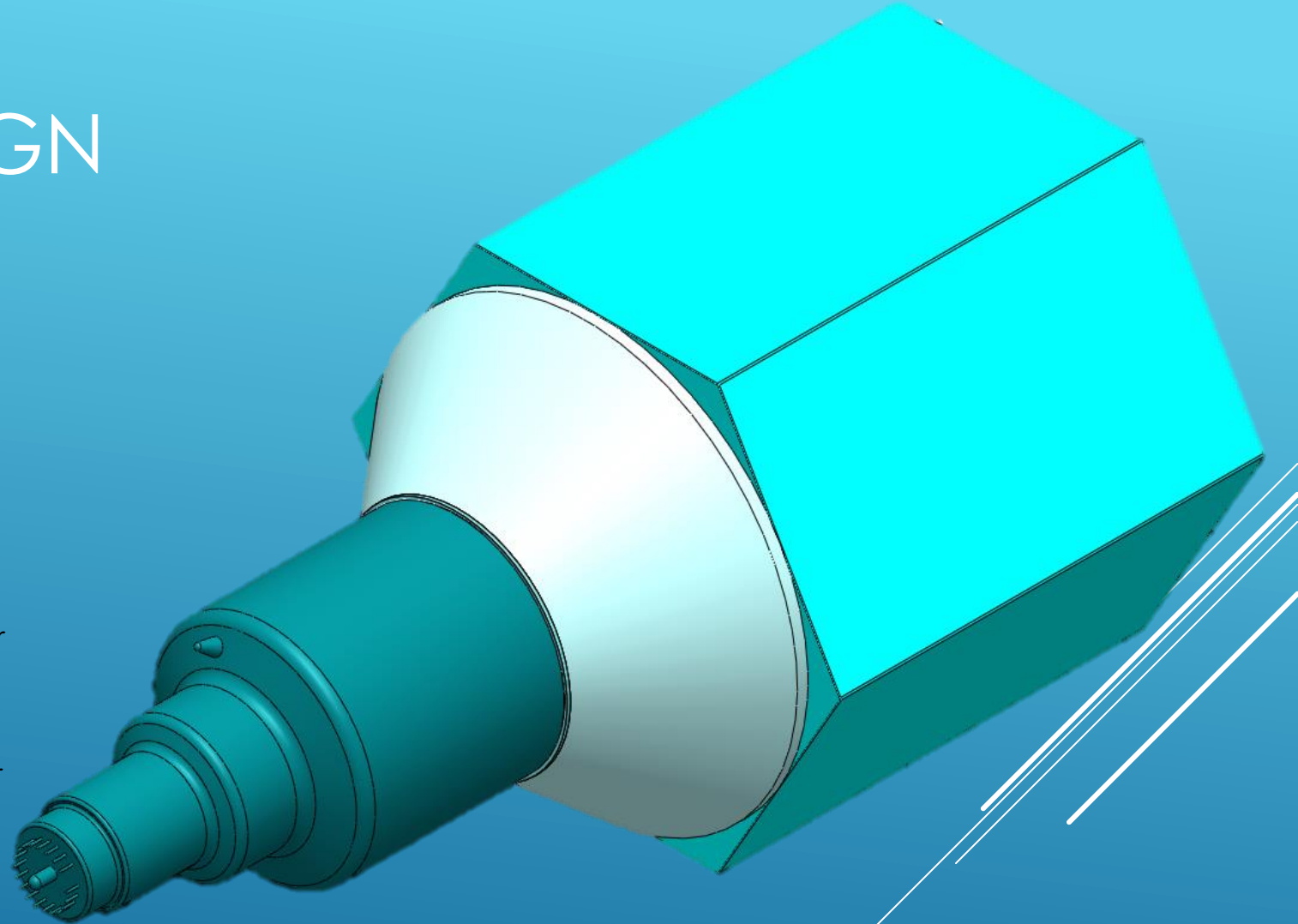
DESIGN CONSIDERATIONS

- Truncated Light Guide Shape
- Diamond Milled & Turned for TIR
- 40° Taper to support critical angle
- 10" Dia. X 1/4" boss for alignment
- 82mm long to support efficiencies

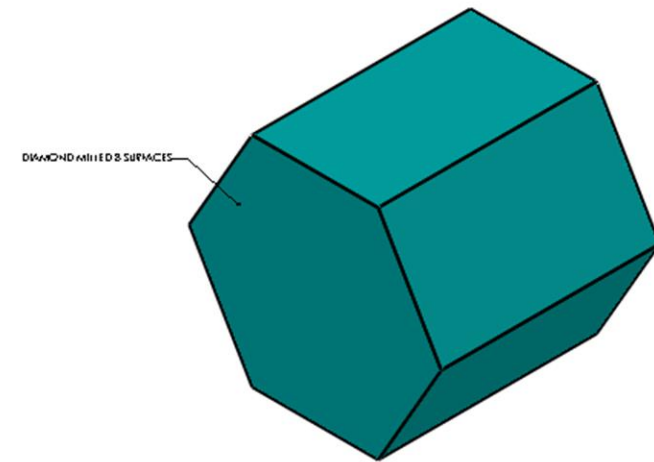
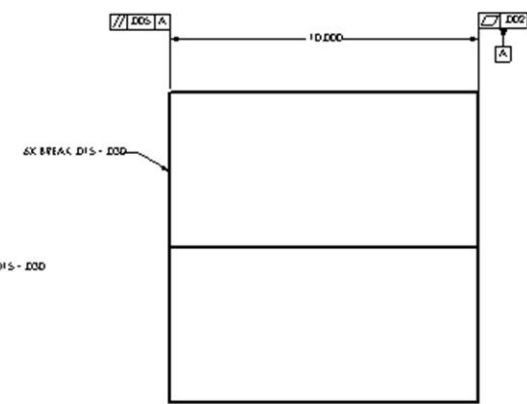
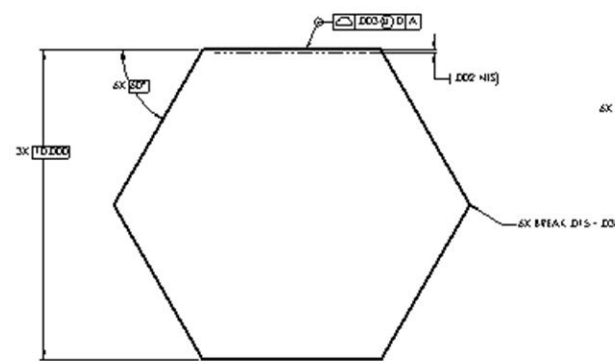
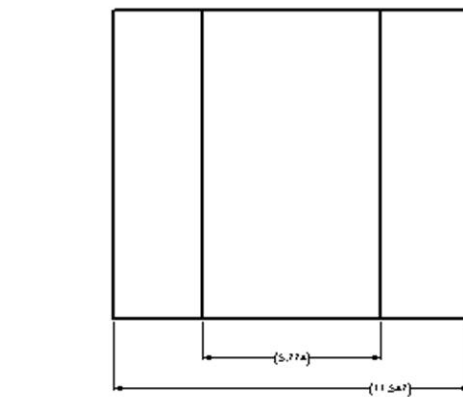
PIXEL HOUSING DESIGN

DESIGN REQUIREMENTS

- Scintillator Shell to be made of non-ferrous materials not to exceed .125" thickness. Provide structural stiffness & support.
- Shell & Light Guide housings to provide 2mm airgap for TIR condition, while providing light tight environment to assembly.
- Design to ensure maximum scintillator area for Detector Wall.
- Design so individual Pixels can be readily replaced in Detector Wall for maintenance or repair.
- Ensure individual Pixels remain under 100 lbs. so as not to require Critical Lifts being performed to install or replace.



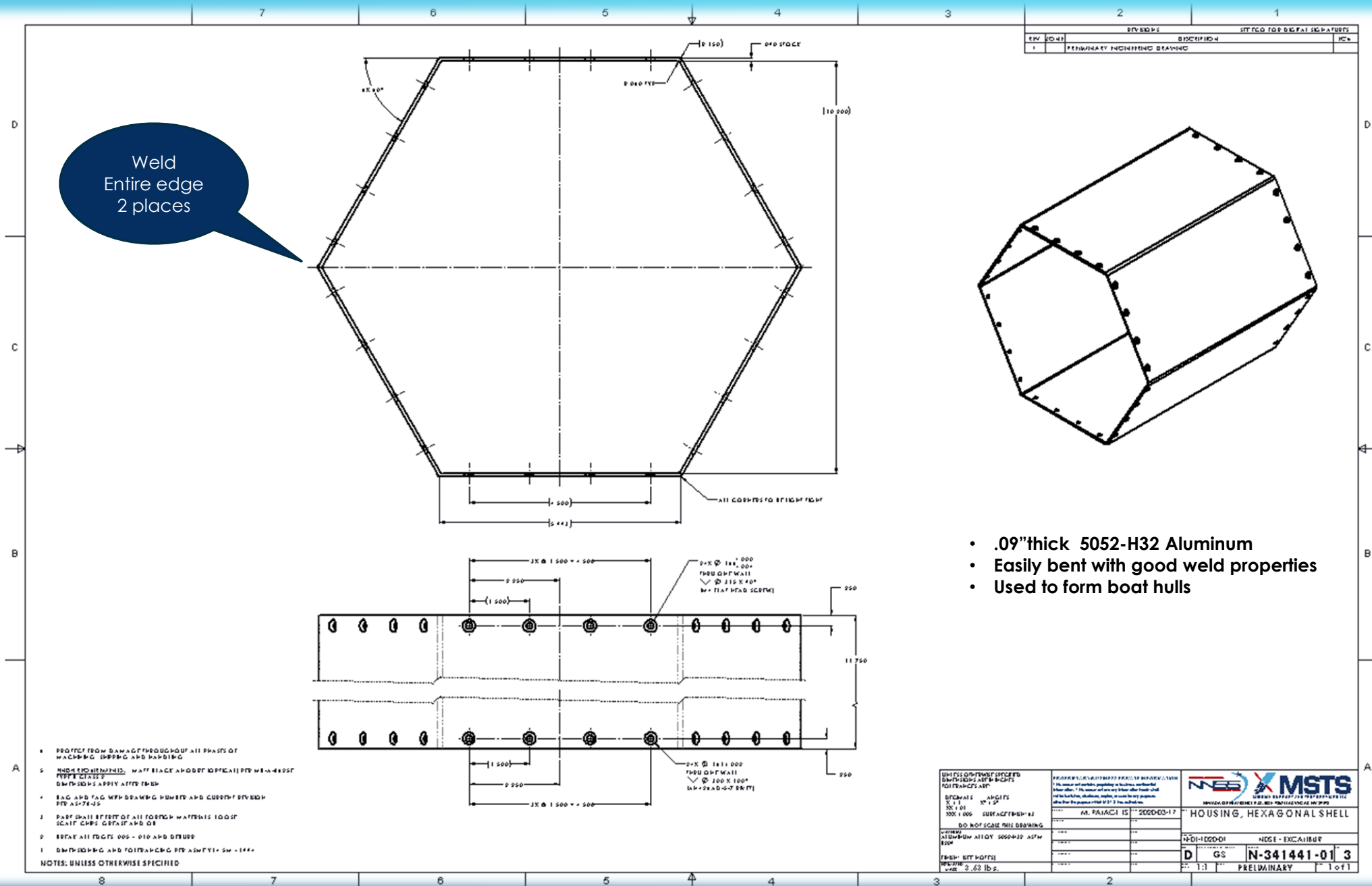
REVISIONS		SEE LOG FOR DIGITAL SIGNATURES	
REV	DATE	DESCRIPTION	BY
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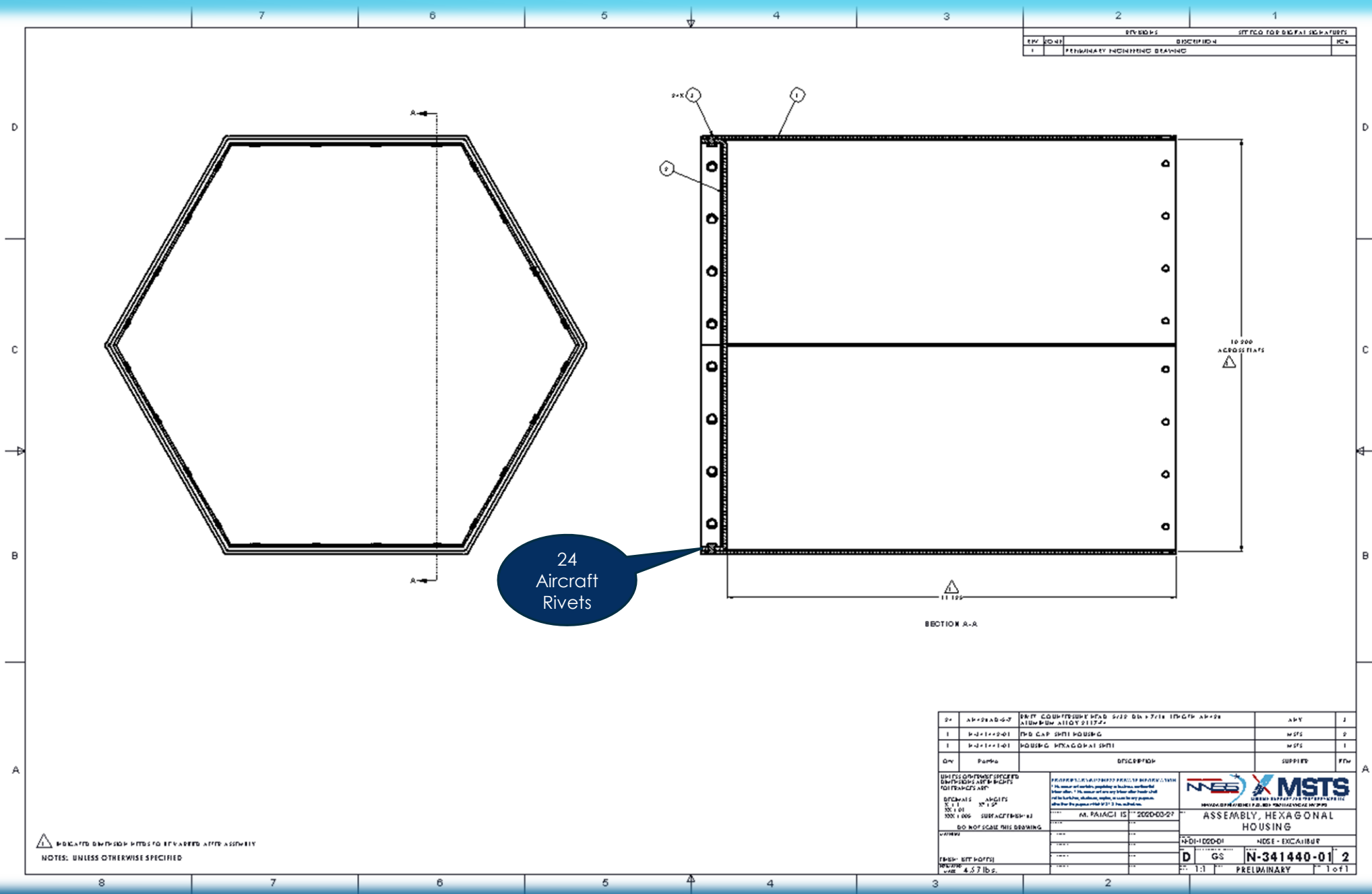


NOTE: Datum A surface to be held flat within .002". This surface mates with Datum A surface of The Light Guide, to provide a glue joint of 100um.

7. QUALITY ASSURANCE REQUIREMENTS:
MATERIALS: EXCEPT SCHEMATIC 1:58 INDEX @ 391 MM 89% TRANSMISSION
OUTLET LENGTH
 8. PROJECT HOW DRAWING (INDICATE ALL PHASES OF
MACHINING, SHIPPING AND HANDLING.)
 9. WELD REQUIREMENTS: DRAWING AND ALL SURFACES TO A MAX. FIN.
 10. BAC AND IAC WITH DRAWING NUMBER AND CURRENT REVISION
PER AS4735.
 11. PART SHALL BE FREE OF ALL FOREIGN MATERIALS (GROSS
SCALE CHIPS CRATE AND ON).
 12. DIRECTIONS AND TOLERANCES PER ASME Y14.5M-1994.
- NOTES: NONE OTHERWISE SPECIFIED

[illegible]





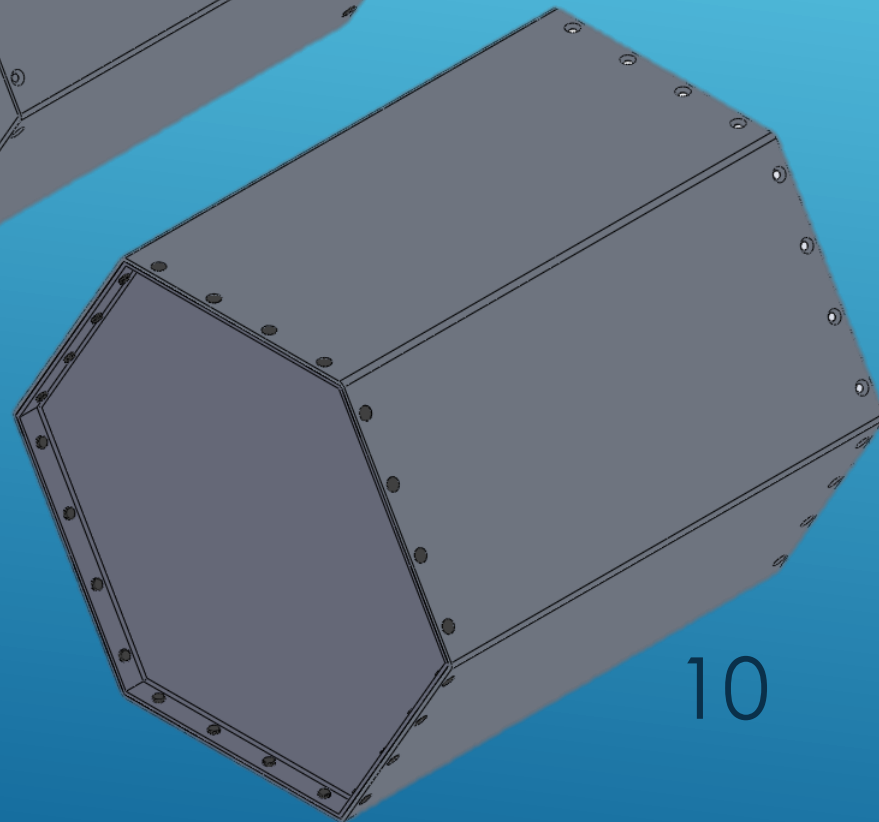
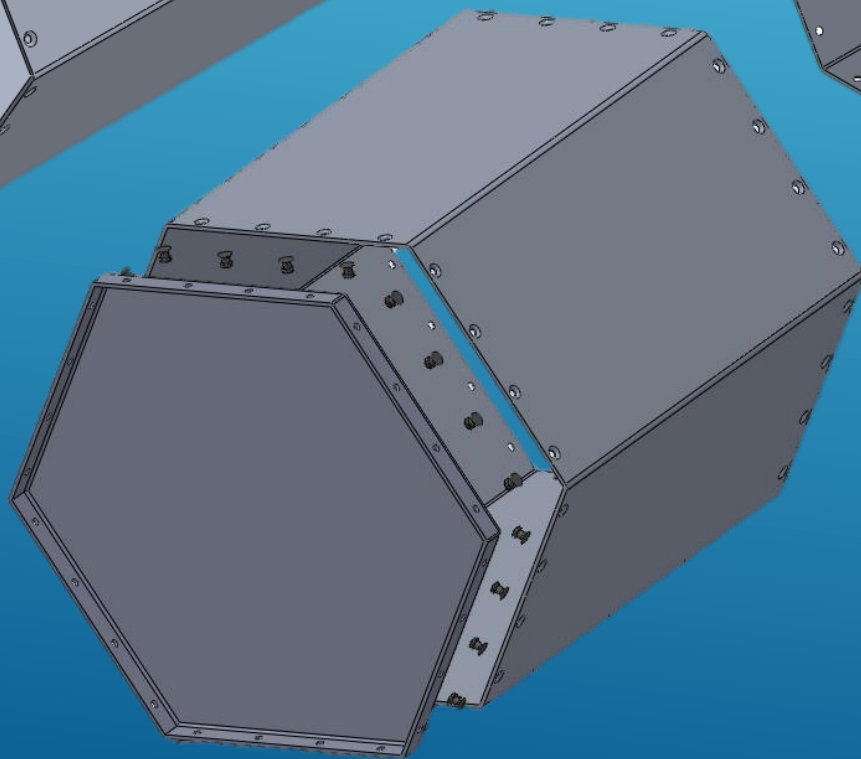
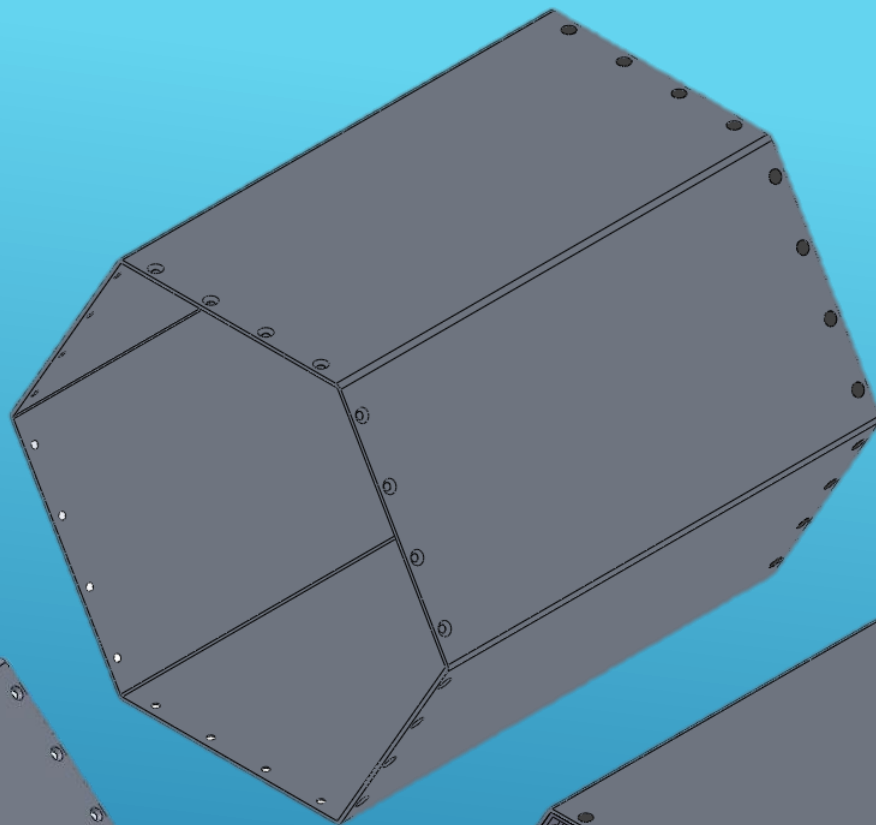
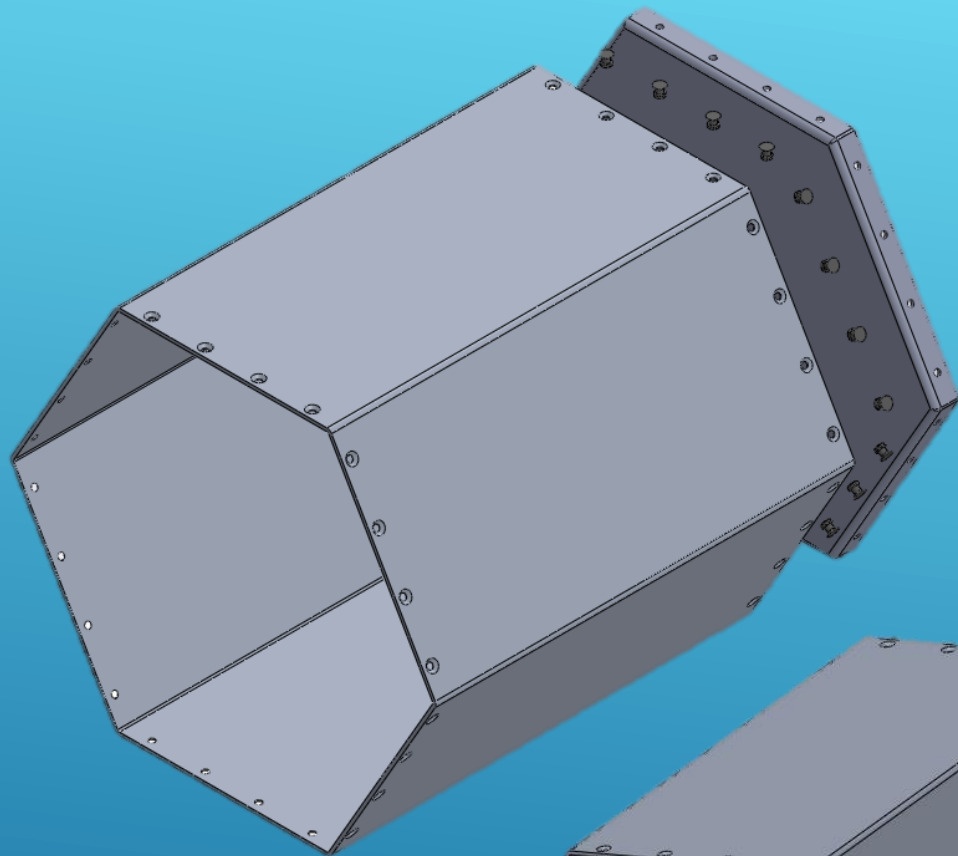
24 Aircraft Rivets

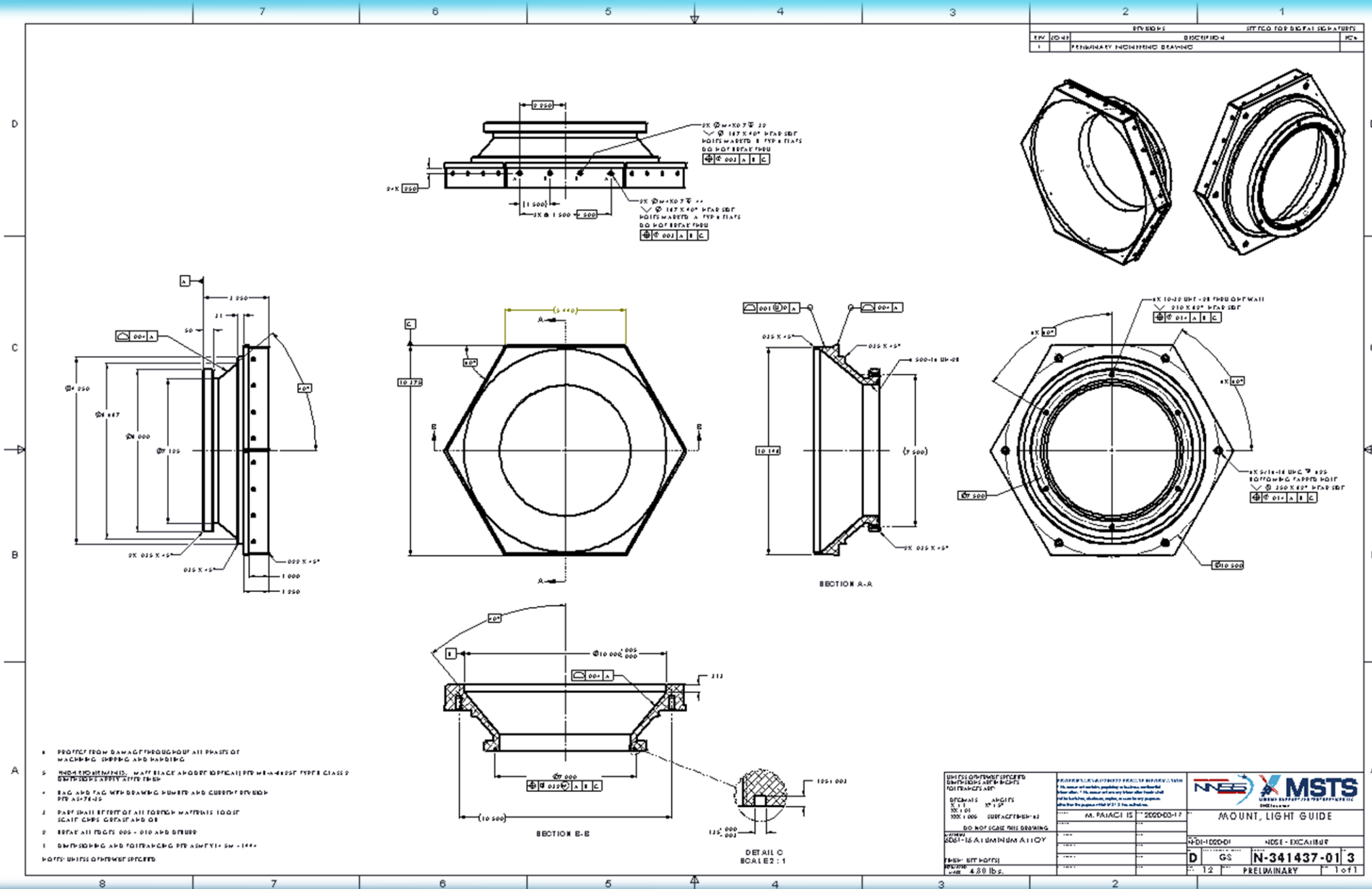
INDICATED DIMENSION VALUES TO BE VERIFIED AFTER ASSEMBLY
NOTES: UNLESS OTHERWISE SPECIFIED

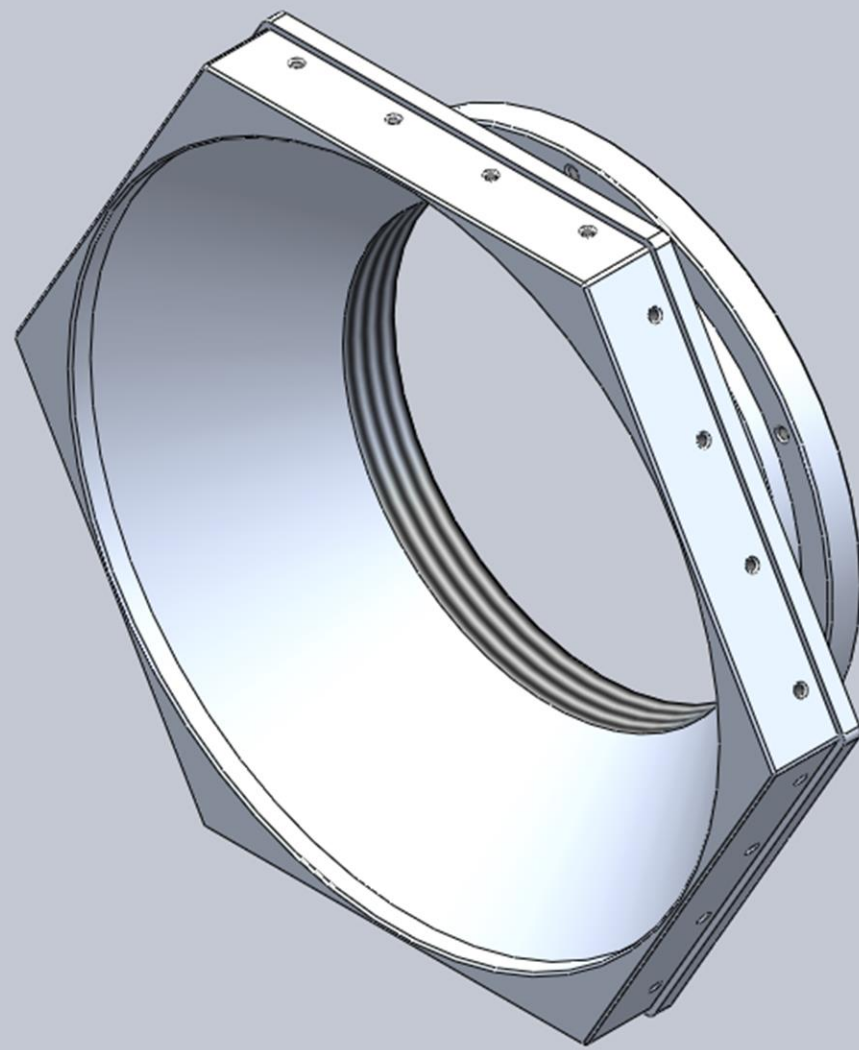
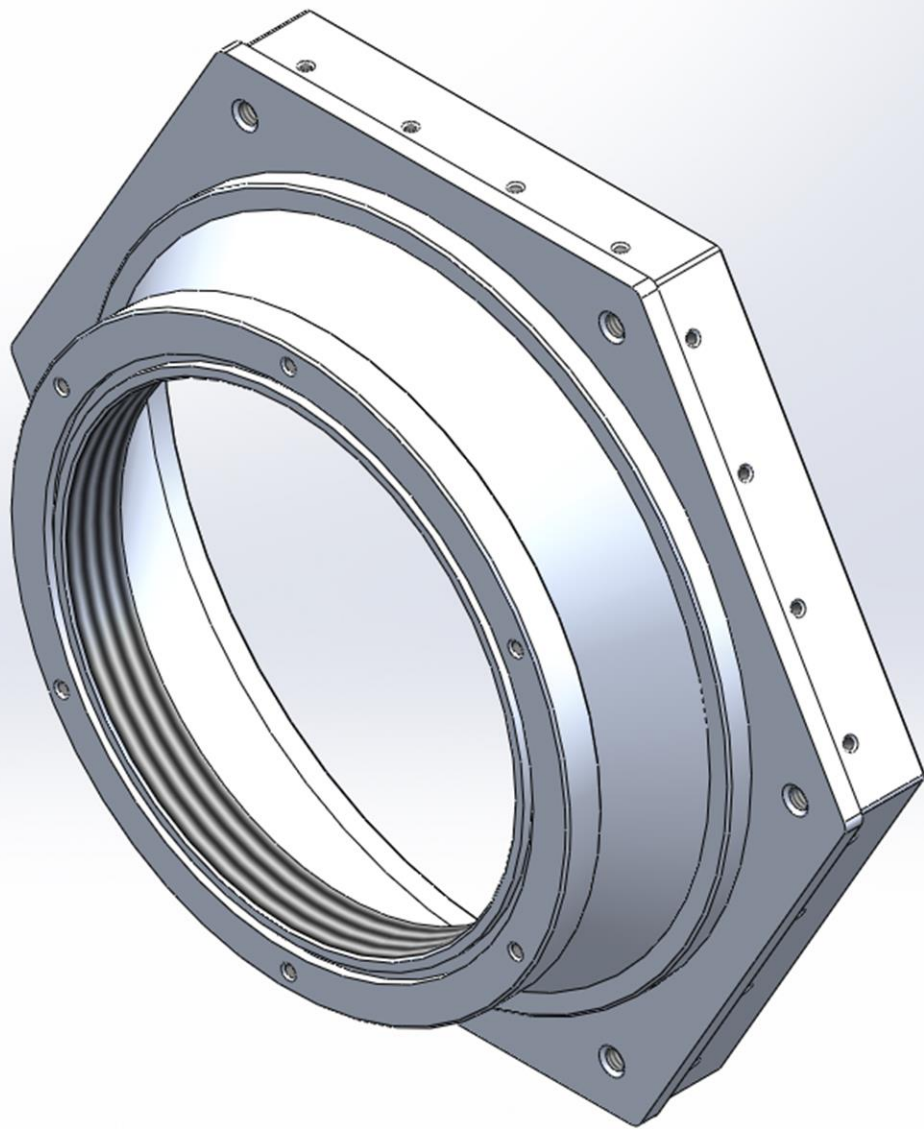
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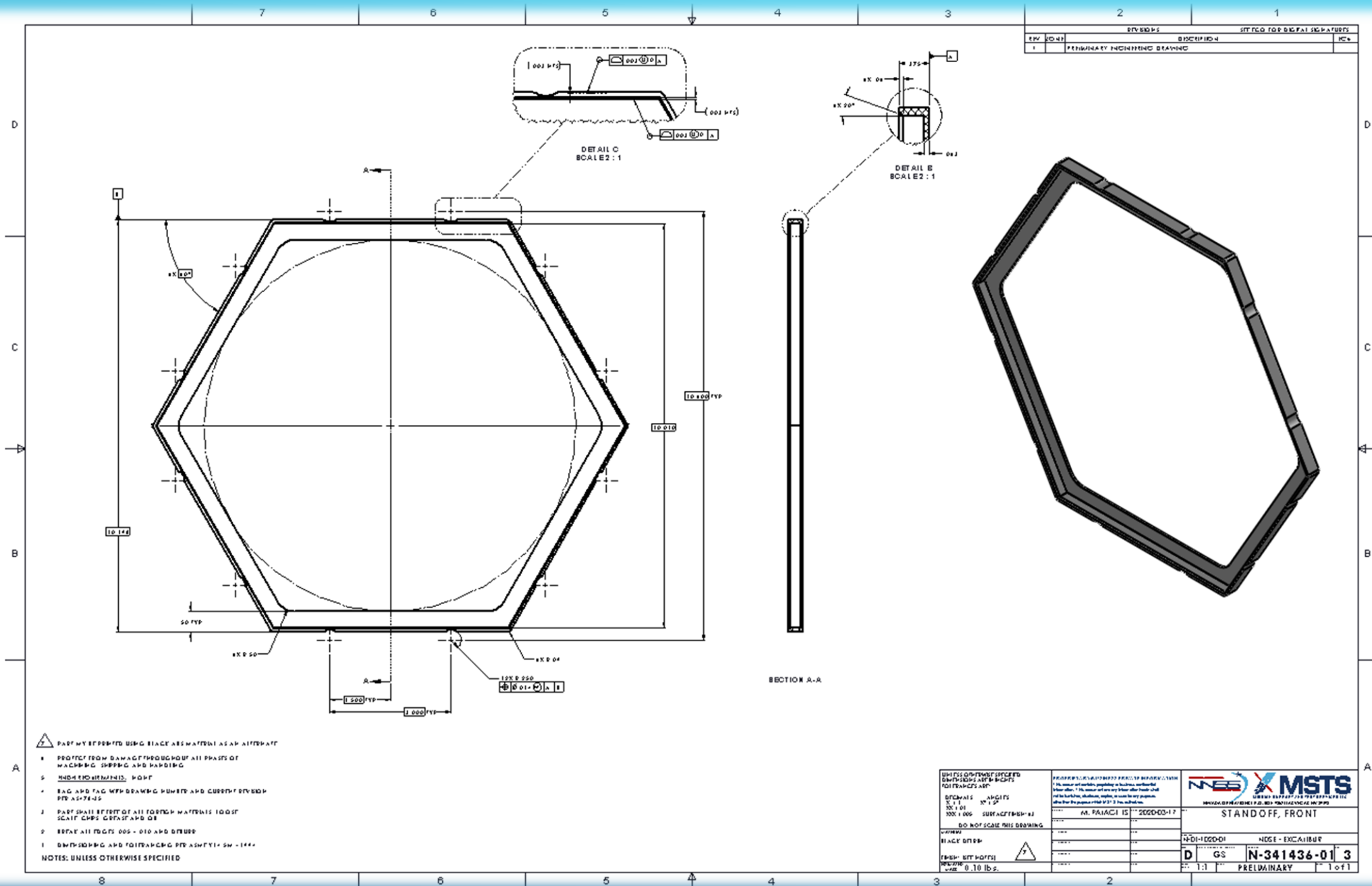
QTY	Part No.	DESCRIPTION	SUPPLIER	REV
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1	AK-28A-009	RAIL COUNTERSINK HEAD 5/16 DIA x 7/16 LENGTH AK-28	ANY	1
1	AK-28A-010	RAIL COUNTERSINK HEAD 5/16 DIA x 7/16 LENGTH AK-28	ANY	1
1	AK-28A-011	RAIL COUNTERSINK HEAD 5/16 DIA x 7/16 LENGTH AK-28	ANY	1
1	AK-28A-012	RAIL COUNTERSINK HEAD 5/16 DIA x 7/16 LENGTH AK-28	ANY	1
1	AK-28A-013	RAIL COUNTERSINK HEAD 5/16 DIA x 7/16 LENGTH AK-28	ANY	1
1	AK-28A-014	RAIL COUNTERSINK HEAD 5/16 DIA x 7/16 LENGTH AK-28	ANY	1
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1	AK-28A-019	RAIL COUNTERSINK HEAD 5/16 DIA x 7/16 LENGTH AK-28	ANY	1
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1	AK-28A-100	RAIL COUNTERSINK HEAD 5/16 DIA x 7/16 LENGTH AK-28	ANY	1

UNIT: DIMENSIONS SPECIFIED DIMENSIONS ARE IN INCHES DIMENSIONS ARE X 1/16 X 1/8 X 1/4 X 1/2 X 3/4 X 1 X 1 1/4 X 1 1/2 X 2 X 3 X 4 X 6 X 8 X 12 X 18 X 24 X 30 X 36 X 48 X 60 X 72 X 96 X 120 X 144 X 180 X 216 X 240 X 288 X 324 X 360 X 432 X 480 X 540 X 600 X 648 X 720 X 792 X 864 X 960 X 1080 X 1200 X 1296 X 1440 X 1584 X 1728 X 1920 X 2160 X 2304 X 2592 X 2880 X 3240 X 3600 X 4032 X 4320 X 4608 X 4800 X 5184 X 5400 X 5760 X 6000 X 6480 X 6912 X 7200 X 7560 X 7920 X 8280 X 8640 X 9000 X 9360 X 9720 X 10080 X 10440 X 10800 X 11160 X 11520 X 11880 X 12240 X 12600 X 12960 X 13320 X 13680 X 14040 X 14400 X 14760 X 15120 X 15480 X 15840 X 16200 X 16560 X 16920 X 17280 X 17640 X 18000 X 18360 X 18720 X 19080 X 19440 X 19800 X 20160 X 20520 X 20880 X 21240 X 21600 X 21960 X 22320 X 22680 X 23040 X 23400 X 23760 X 24120 X 24480 X 24840 X 25200 X 25560 X 25920 X 26280 X 26640 X 27000 X 27360 X 27720 X 28080 X 28440 X 28800 X 29160 X 29520 X 29880 X 30240 X 30600 X 30960 X 31320 X 31680 X 32040 X 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159840 X 160200 X 160560 X 160920 X 161280 X 161640 X 162000 X 162360 X 162720 X 163080 X 163440 X 163800 X 164160 X 164520 X 164880 X 165240 X 165600 X 165960 X 166320 X 166680 X 167040 X 167400 X 167760 X 168120 X 168480 X 168840 X 169200 X 169560 X 169920 X 170280 X 170640 X 171000 X 171360 X 171720 X 172080 X 172440 X 172800 X 173160 X 173520 X 173880 X 174240 X 174600 X 174960 X 175320 X 175680 X 176040 X 176400 X 176760 X 177120 X 177480 X 177840 X 178200 X 178560 X 178920 X 179280 X 179640 X 180000 X 180360 X 180720 X 181080 X 181440 X 181800 X 182160 X 182520 X 182880 X 183240 X 183600 X 183960 X 184320 X 184680 X 185040 X 185400 X 185760 X 186120 X 186480 X 186840 X 187200 X 187560 X 187920 X 188280 X 188640 X 189000 X 189360 X 189720 X 190080 X 190440 X 190800 X 191160 X 191520 X 191880 X 192240 X 192600 X 192960 X 193320 X 193680 X 194040 X 194400 X 194760 X 195120 X 195480 X 195840 X 196200 X 196560 X 196920 X 197280 X 197640 X 198000 X 198360 X 198720 X 199080 X 199440 X 199800 X 200160 X 200520 X 200880 X 201240 X 2
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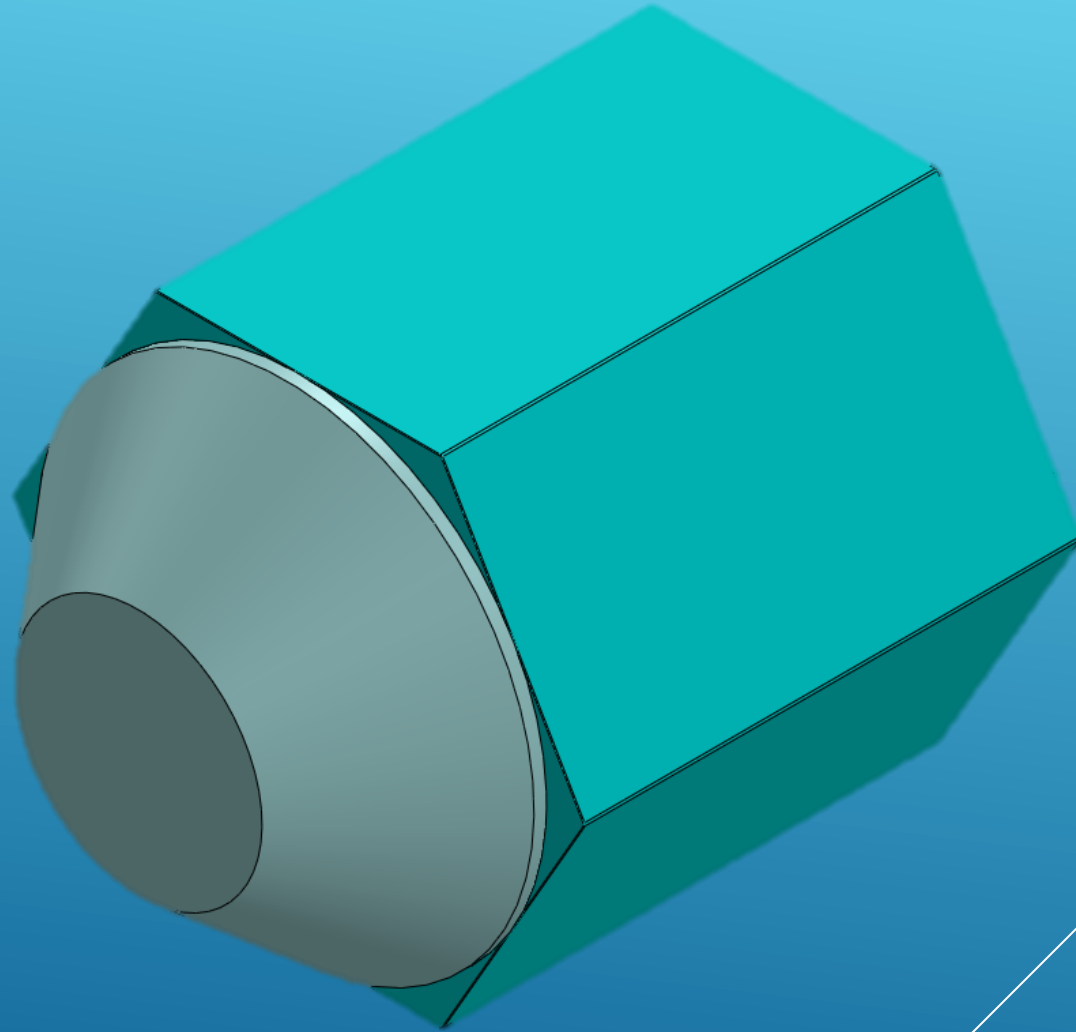




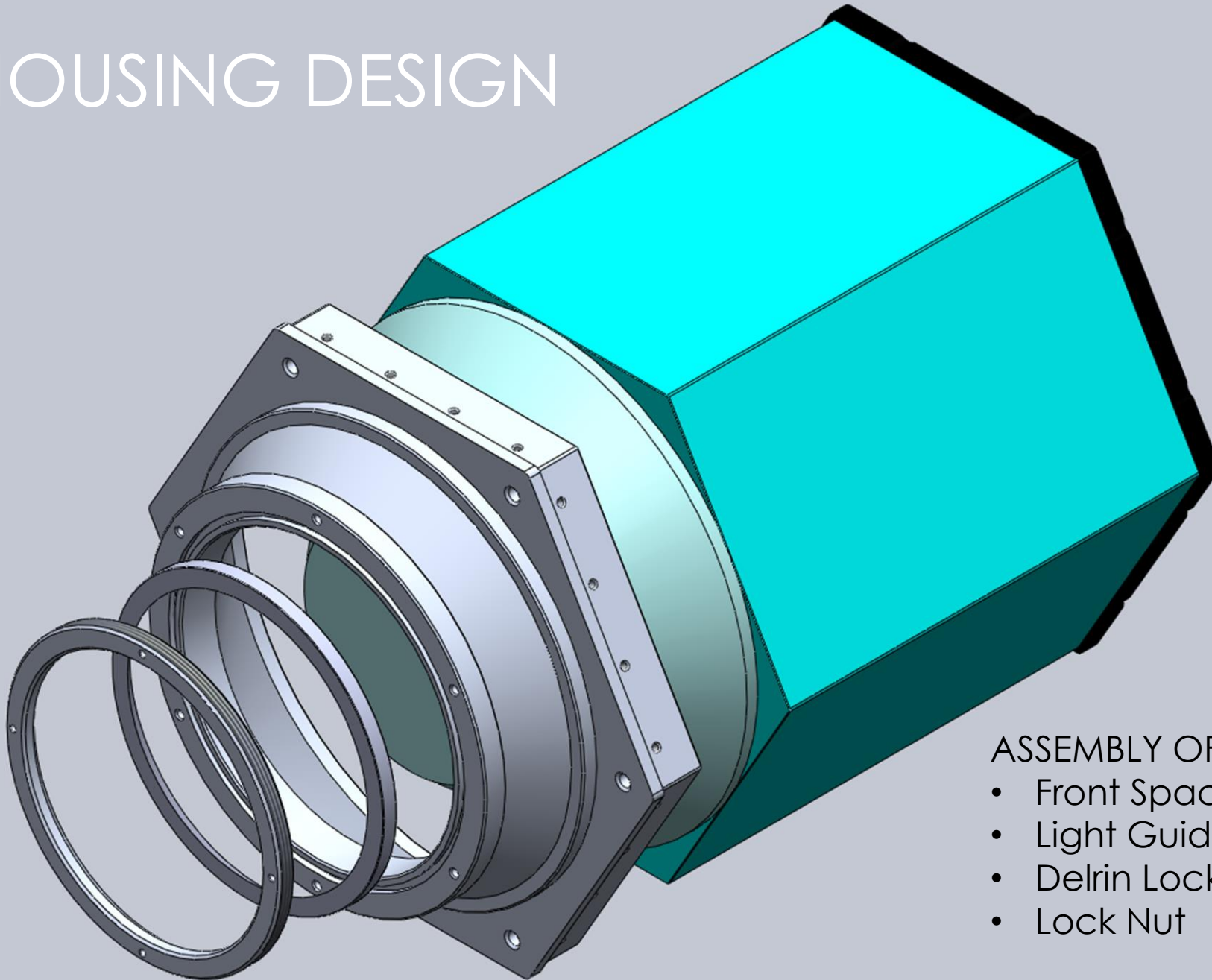
PIXEL HOUSING DESIGN

ASSEMBLY OF HARDWARE

- Scintillator
- Light Guide



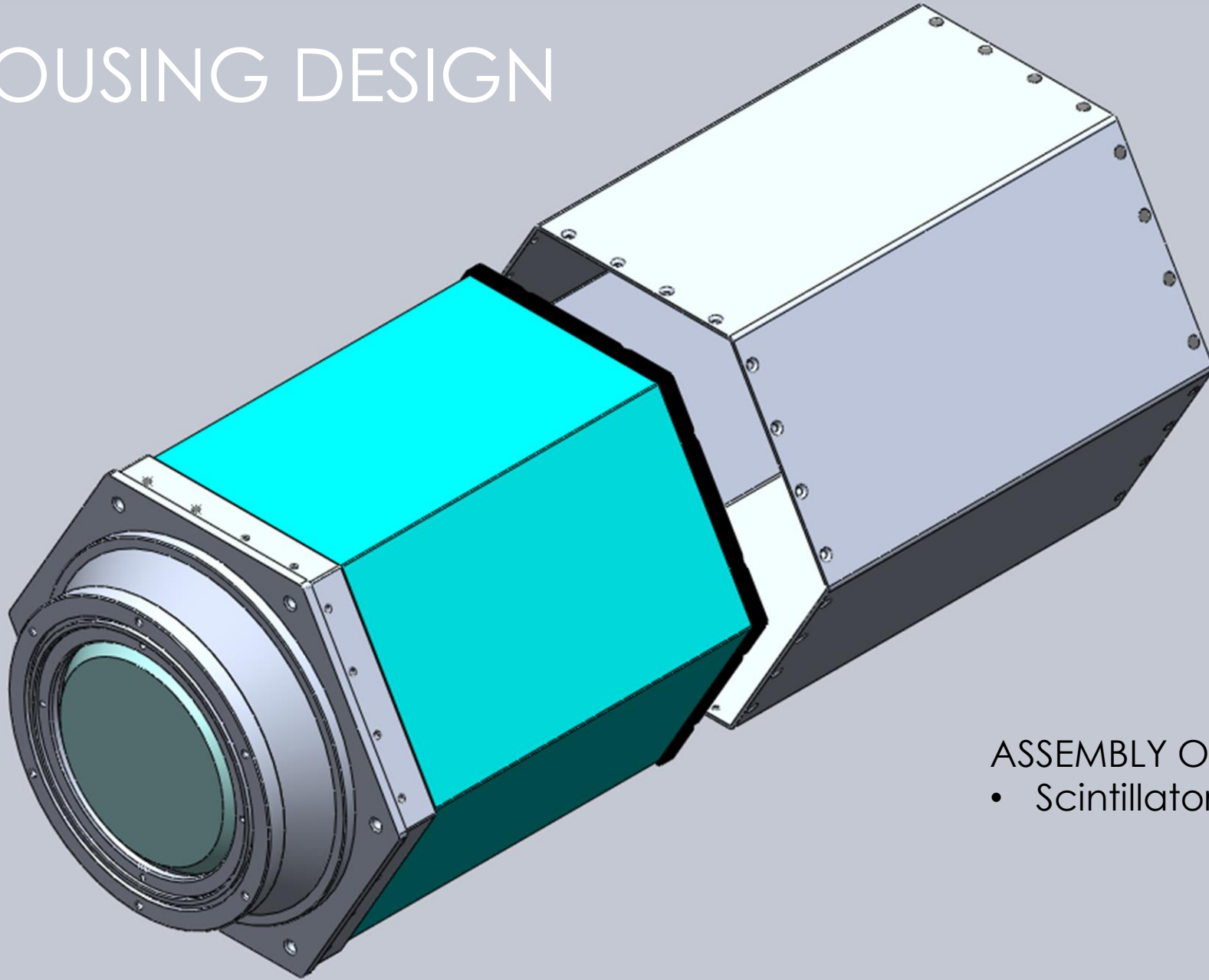
PIXEL HOUSING DESIGN



ASSEMBLY OF HARDWARE

- Front Spacer
- Light Guide Mount
- Delrin Lock Wedge
- Lock Nut

PIXEL HOUSING DESIGN

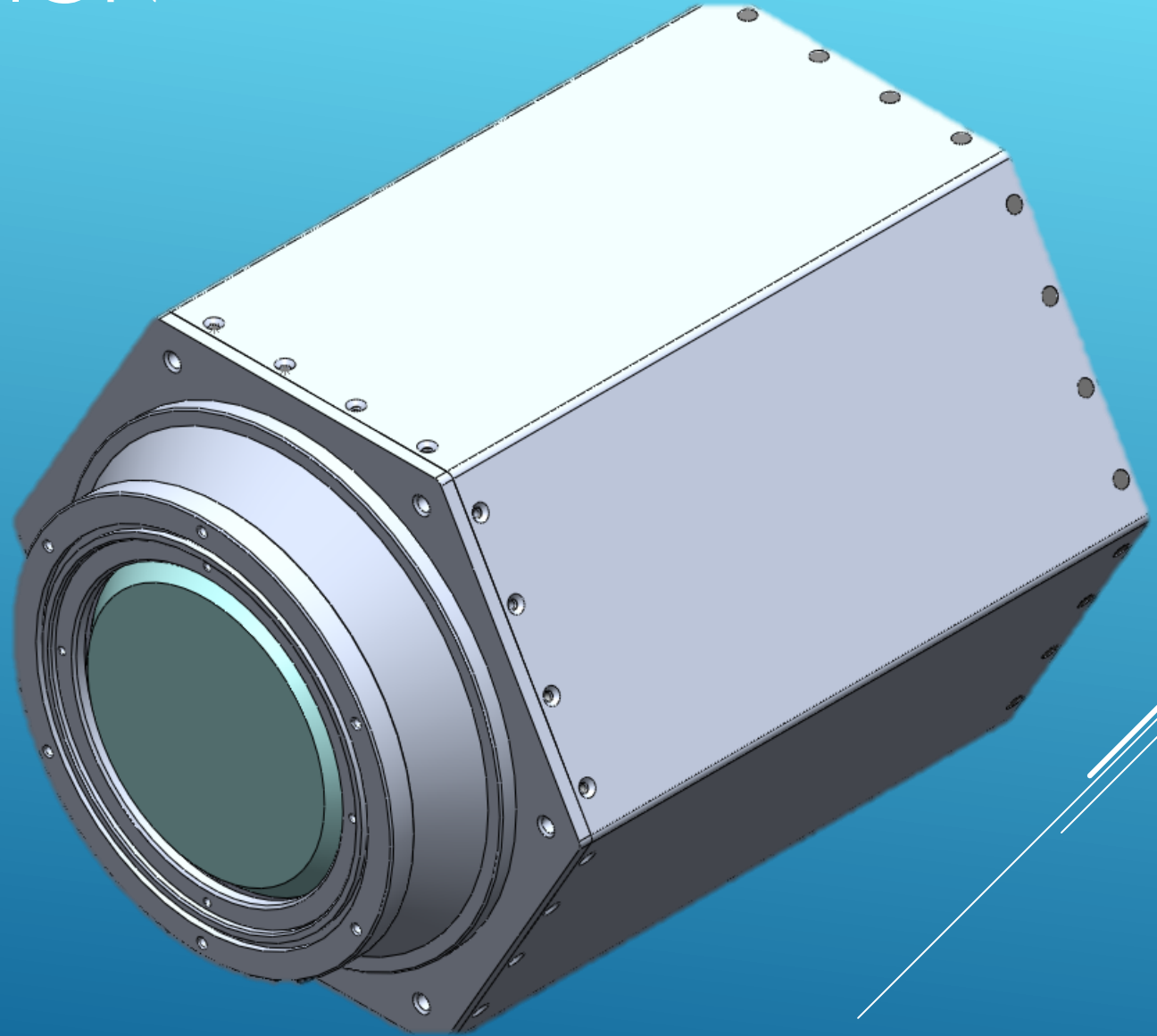


ASSEMBLY OF HARDWARE
• Scintillator Shell

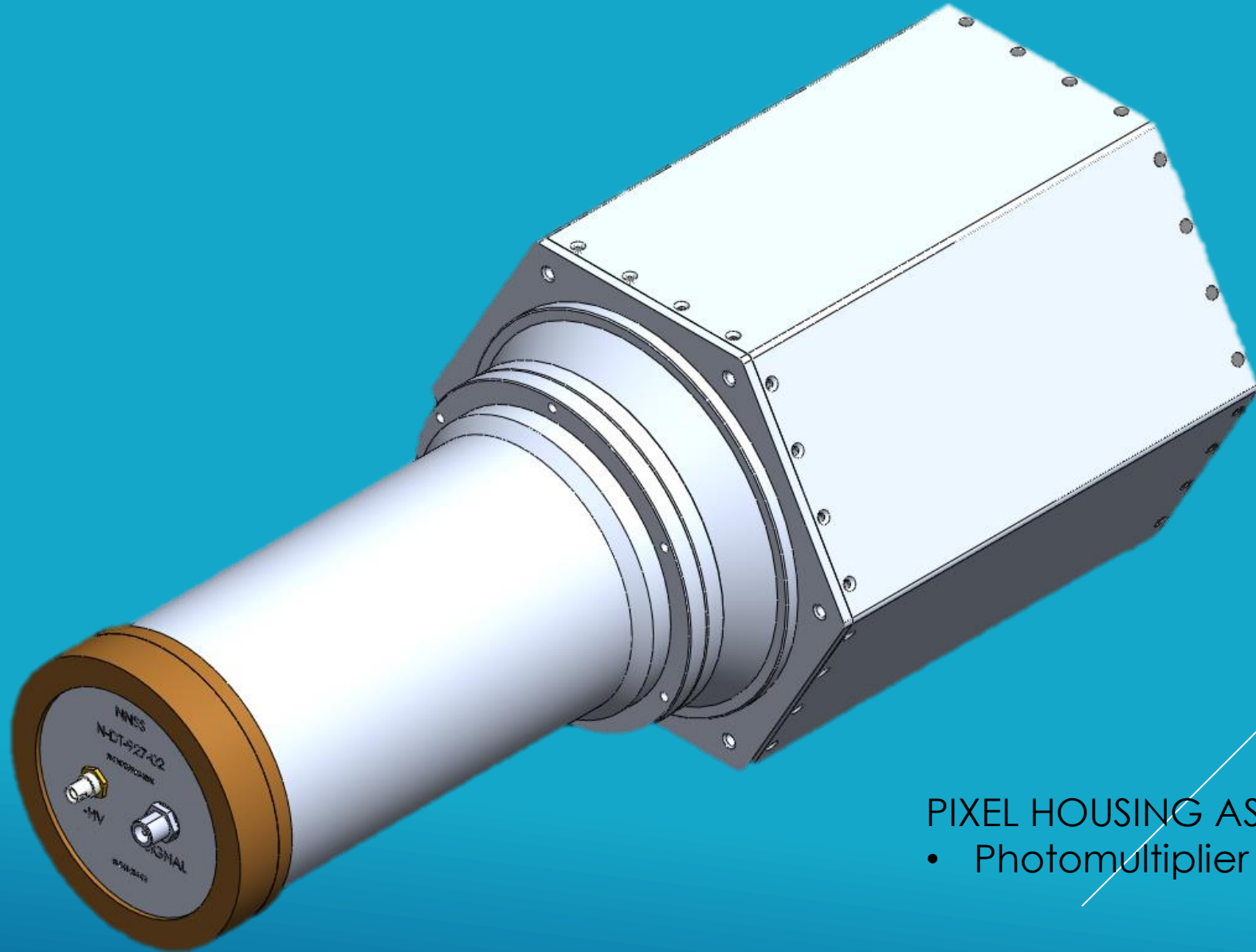
PIXEL HOUSING DESIGN

ASSEMBLED HARDWARE

- Scintillator
- Light Guide
- Front Spacer
- Scintillator Shell
- Light Guide Mount
- Delrin Lock Wedge
- Lock Nut

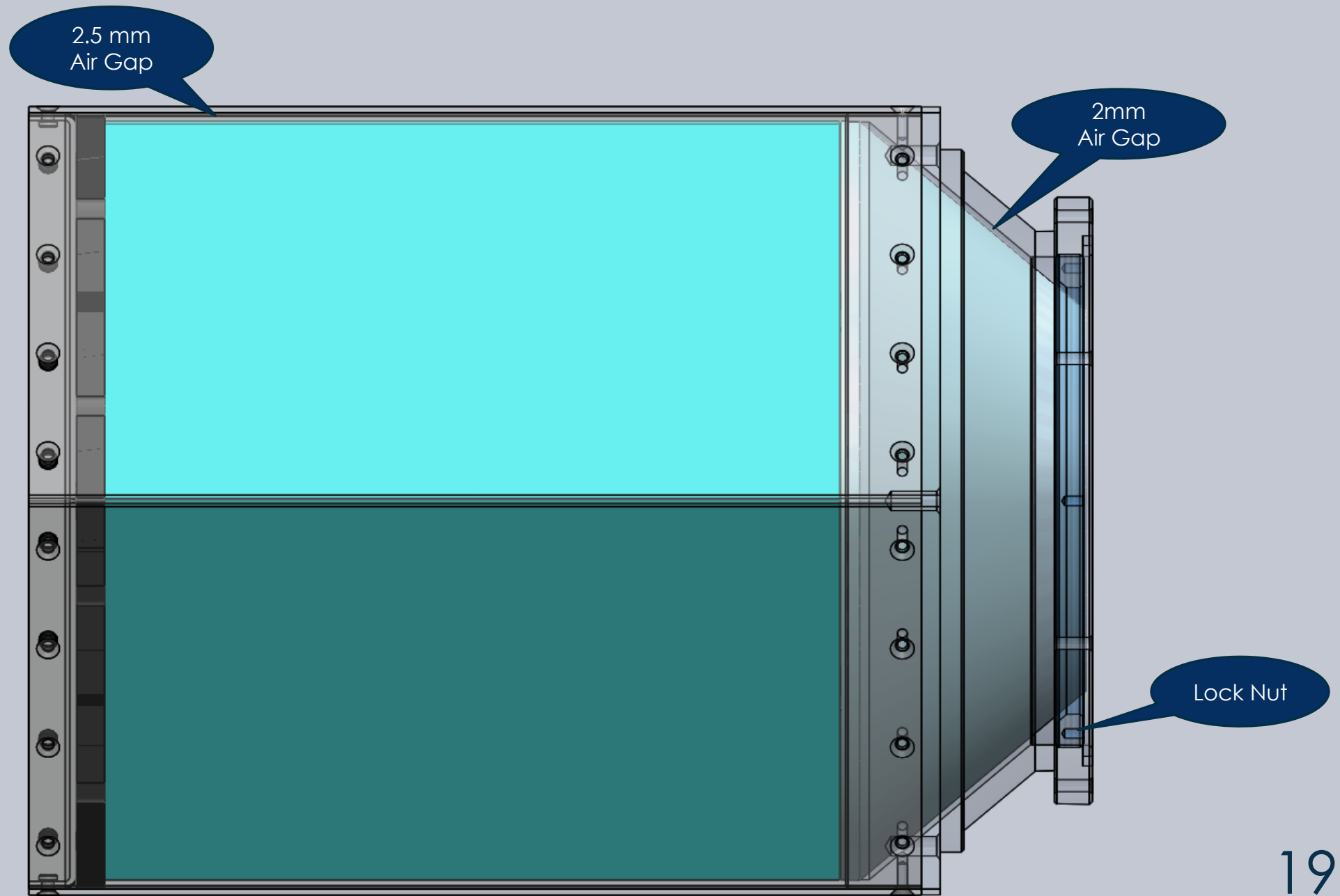


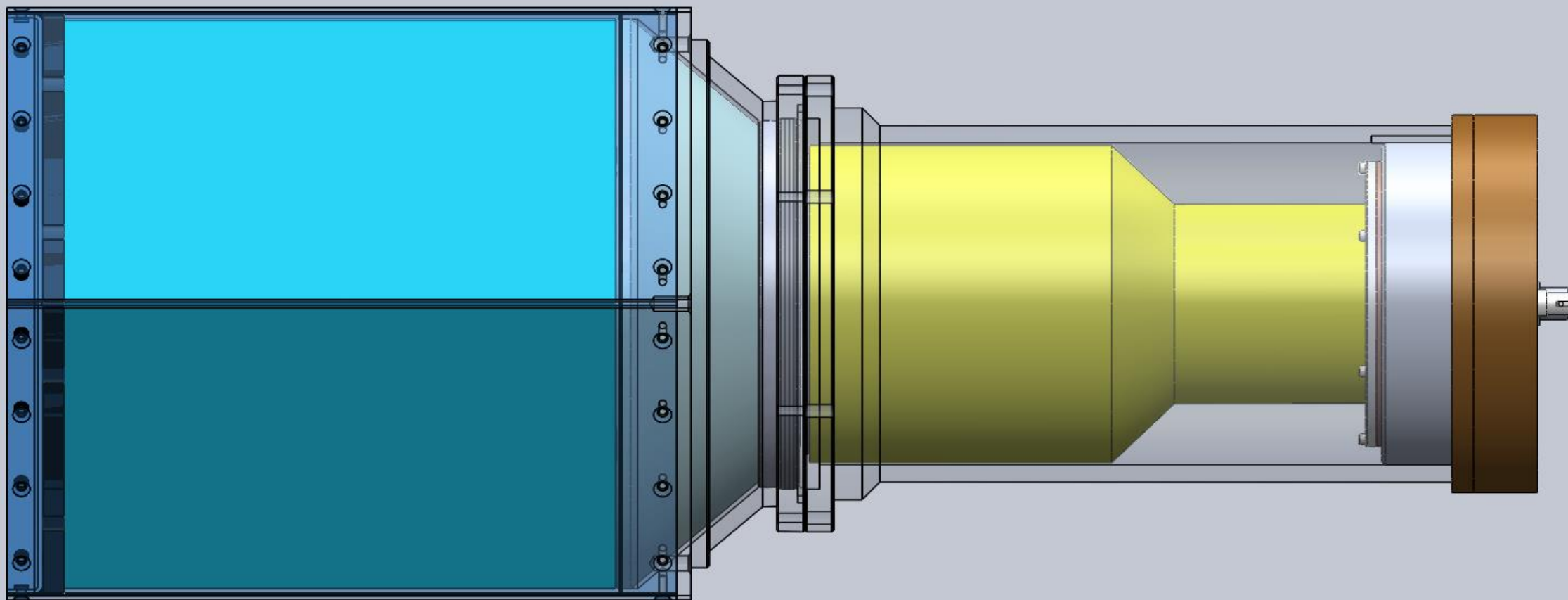
PIXEL HOUSING DESIGN

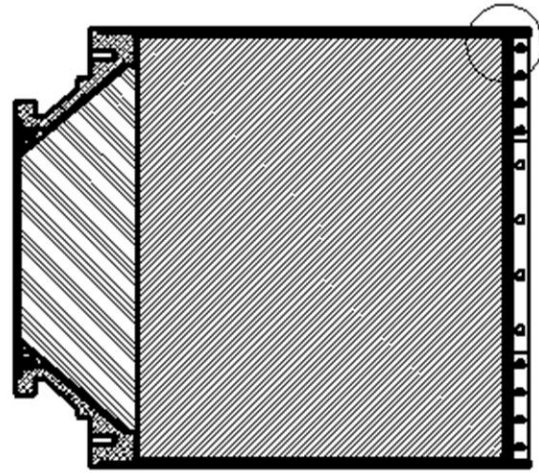
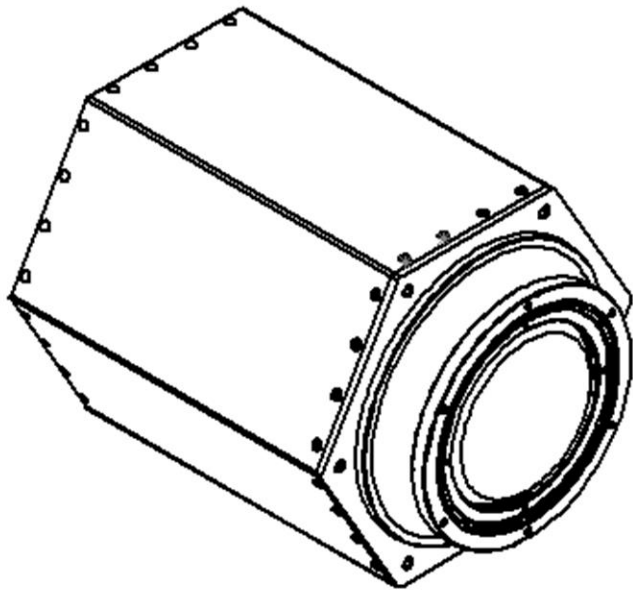


PIXEL HOUSING ASSEMBLY

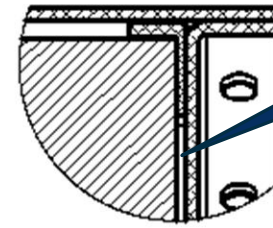
- Photomultiplier & Housing



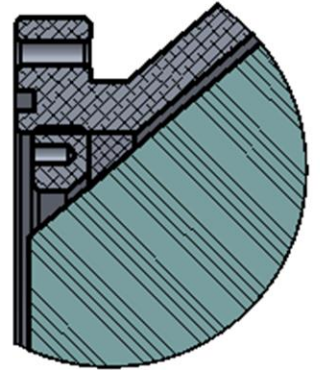




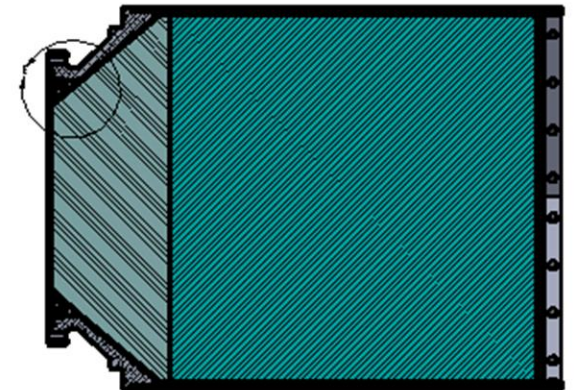
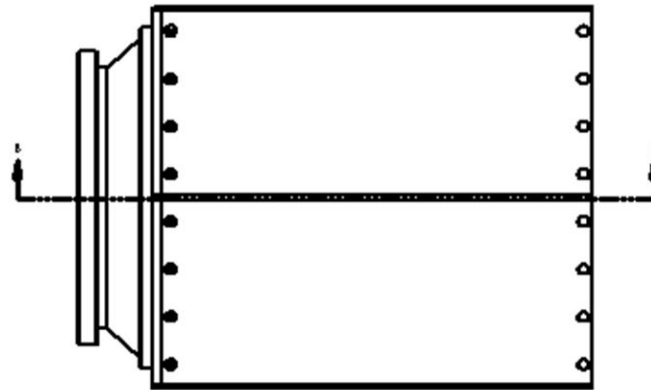
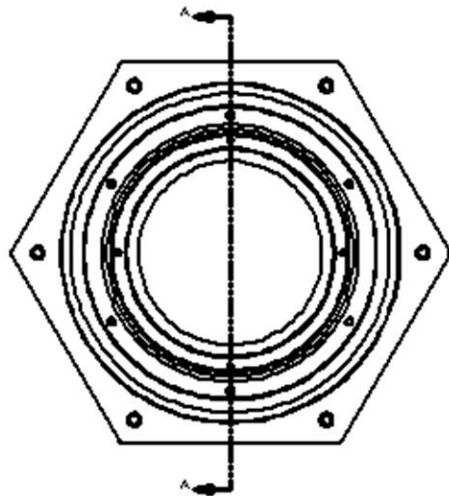
SECTION B-B



DETAIL D
SCALE 2:1



DETAIL E
SCALE 2:1

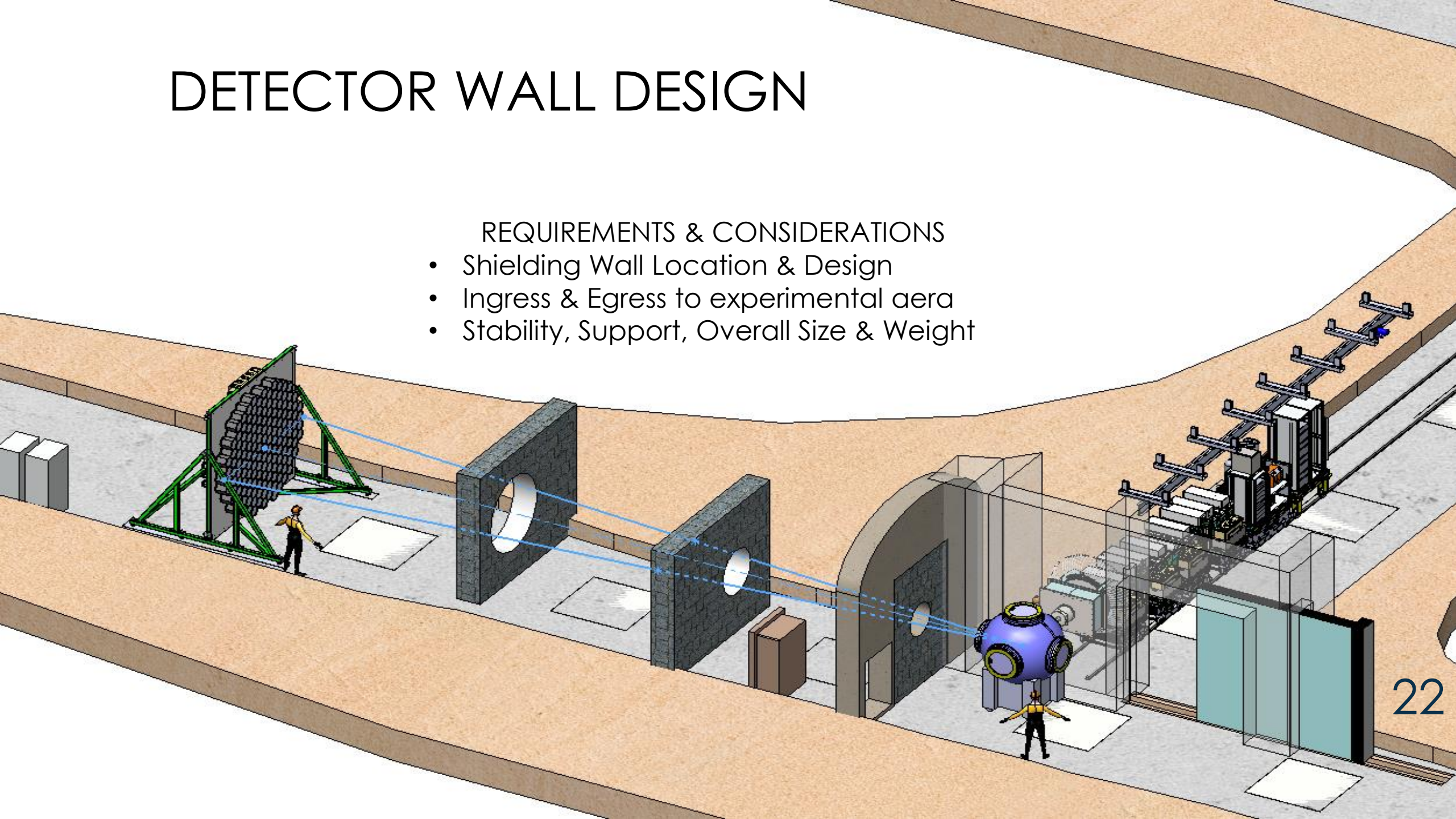


SECTION A-A

DETECTOR WALL DESIGN

REQUIREMENTS & CONSIDERATIONS

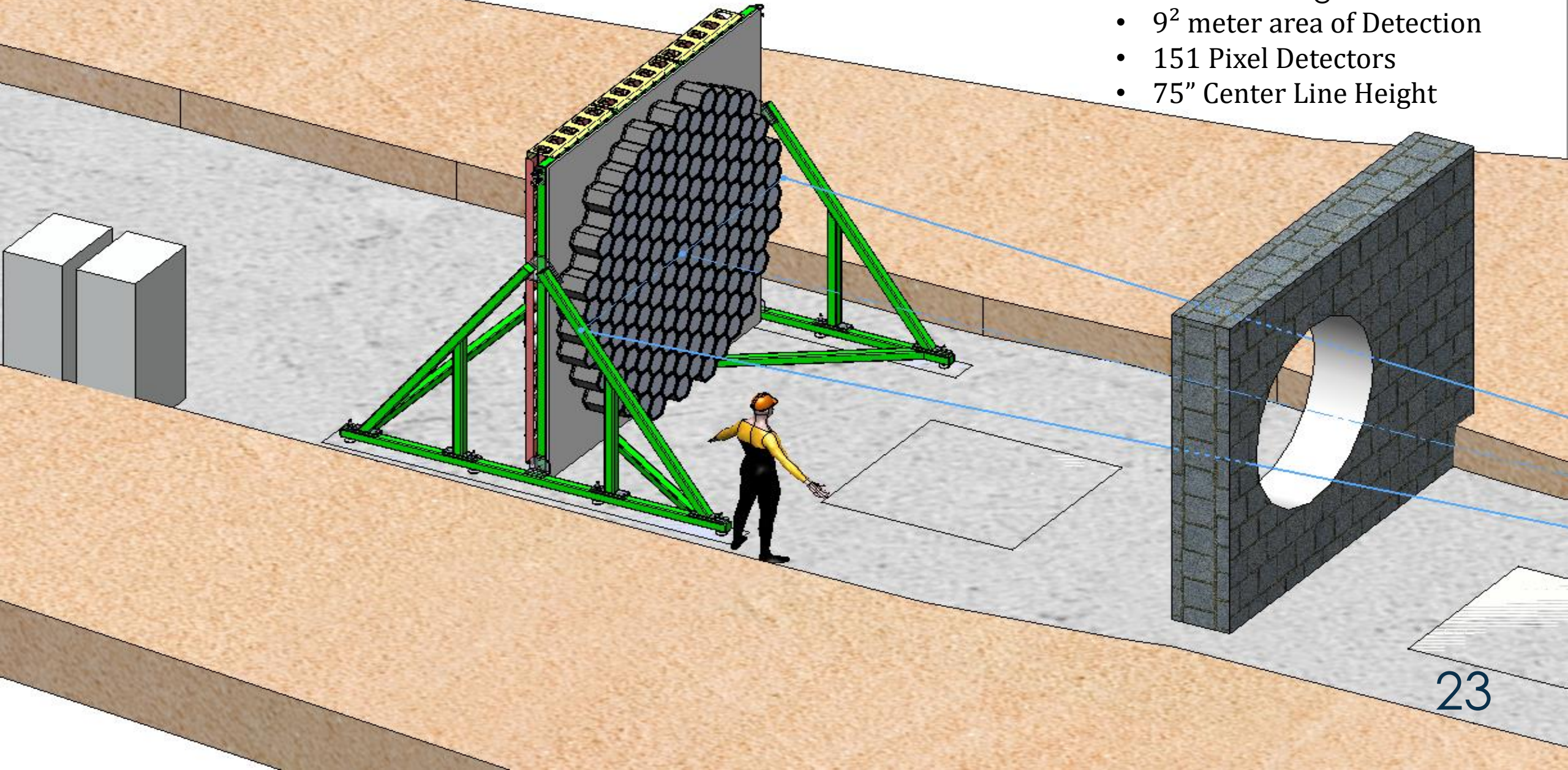
- Shielding Wall Location & Design
- Ingress & Egress to experimental area
- Stability, Support, Overall Size & Weight



DETECTOR WALL DESIGN

REQUIREMENTS

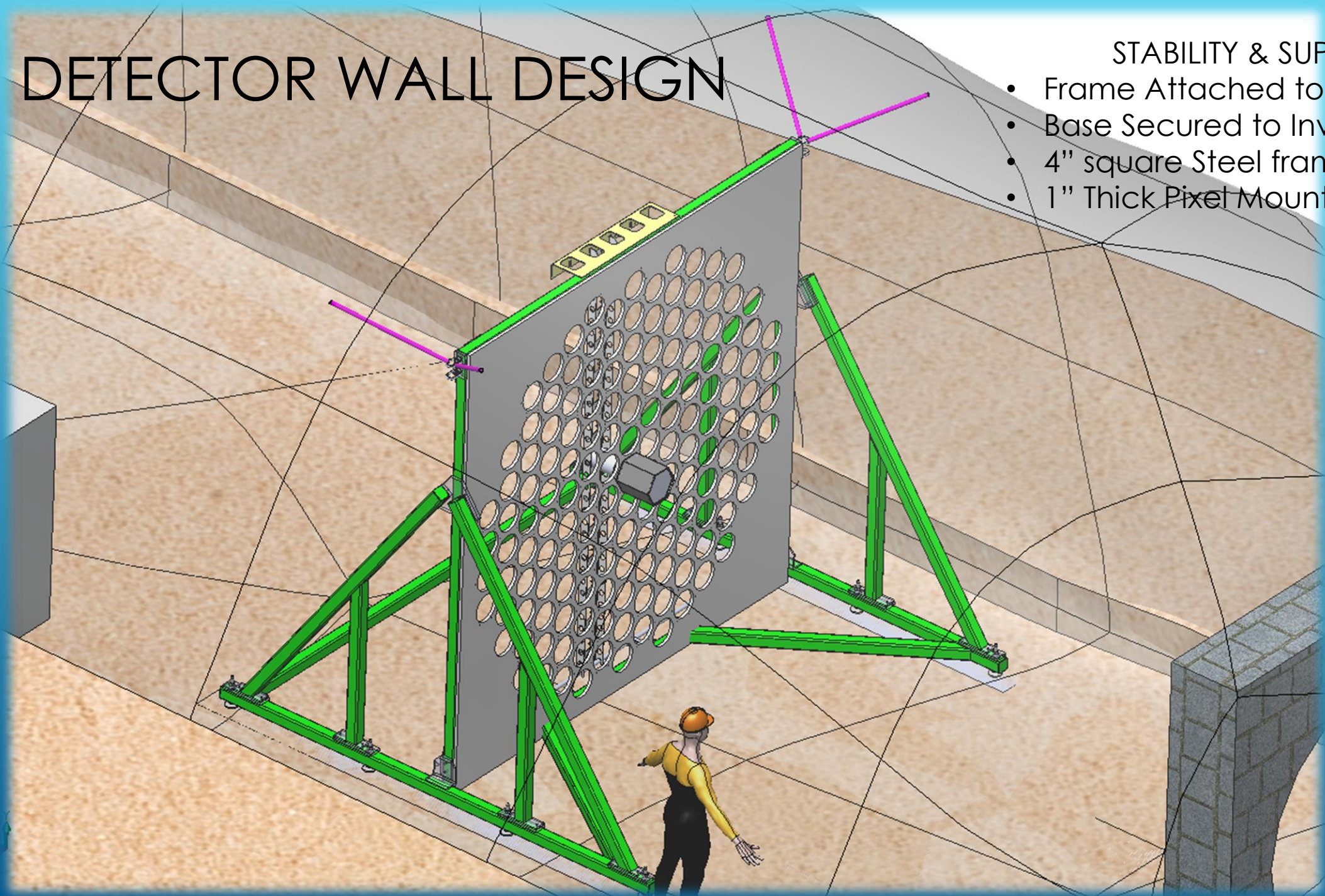
- 20 meter Flight Path
- 9² meter area of Detection
- 151 Pixel Detectors
- 75" Center Line Height



DETECTOR WALL DESIGN

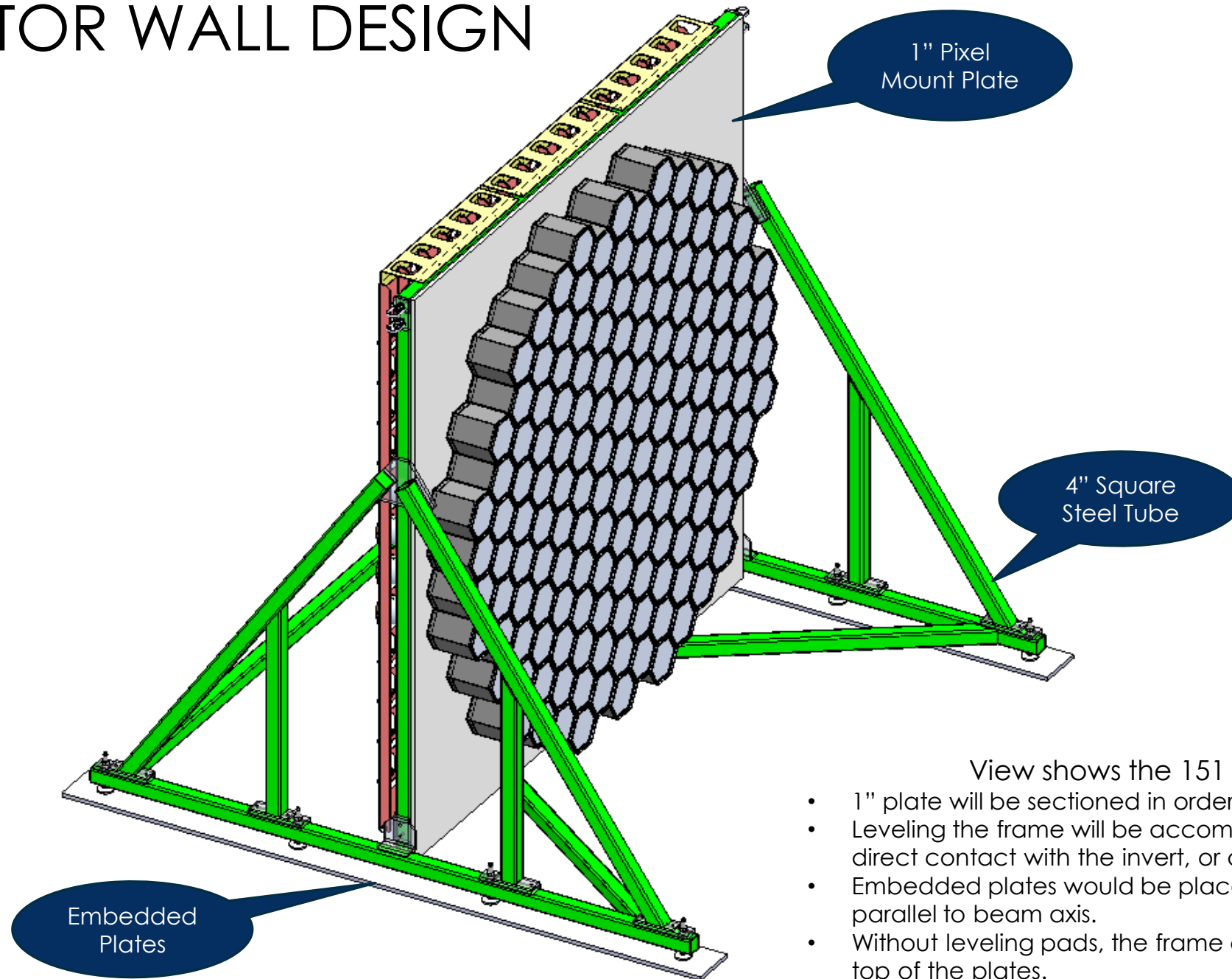
STABILITY & SUPPORT

- Frame Attached to Drift Ribs
- Base Secured to Invert
- 4" square Steel frame
- 1" Thick Pixel Mounting Plate



DETECTOR WALL DESIGN

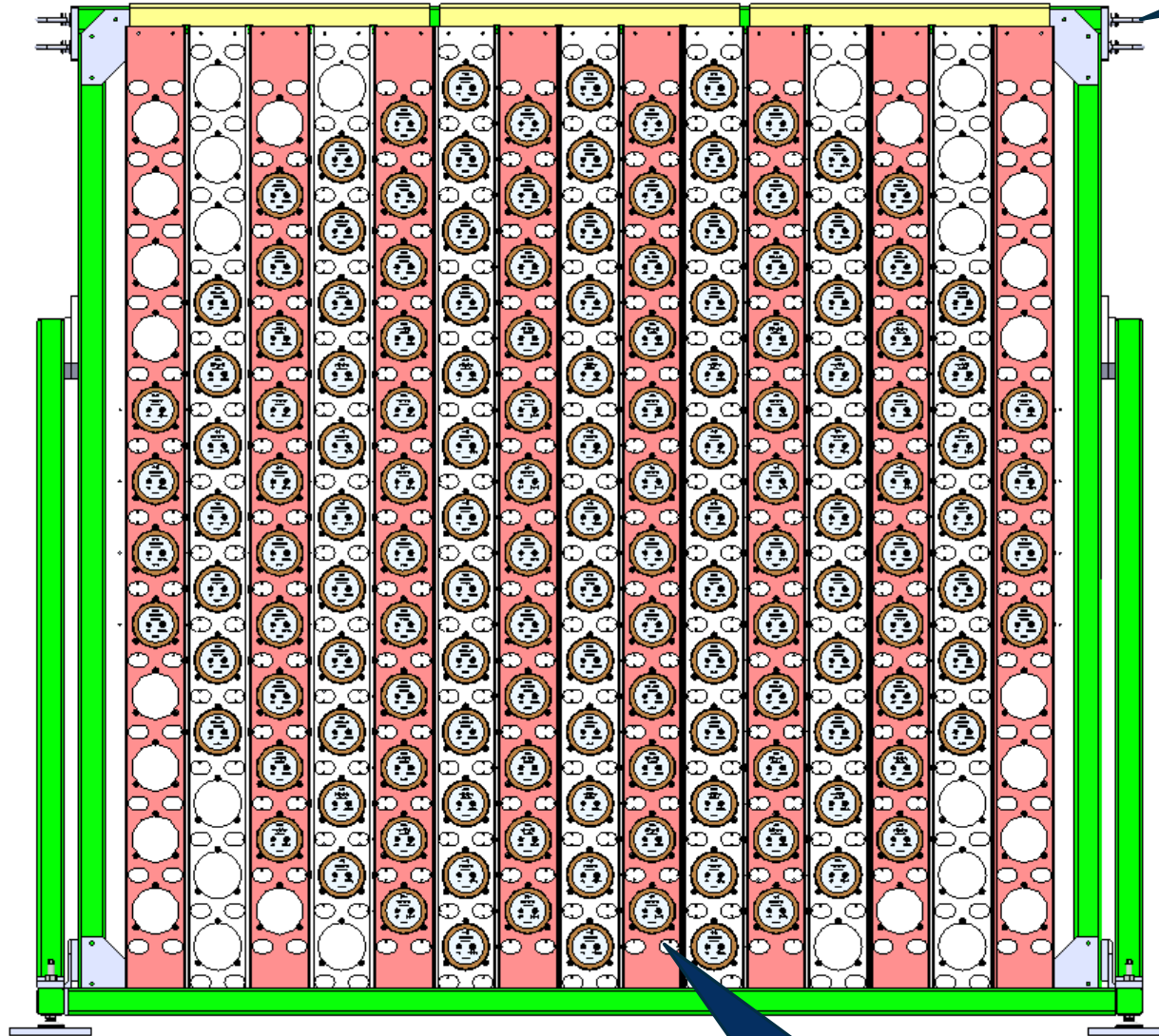
25



View shows the 151 detector array.

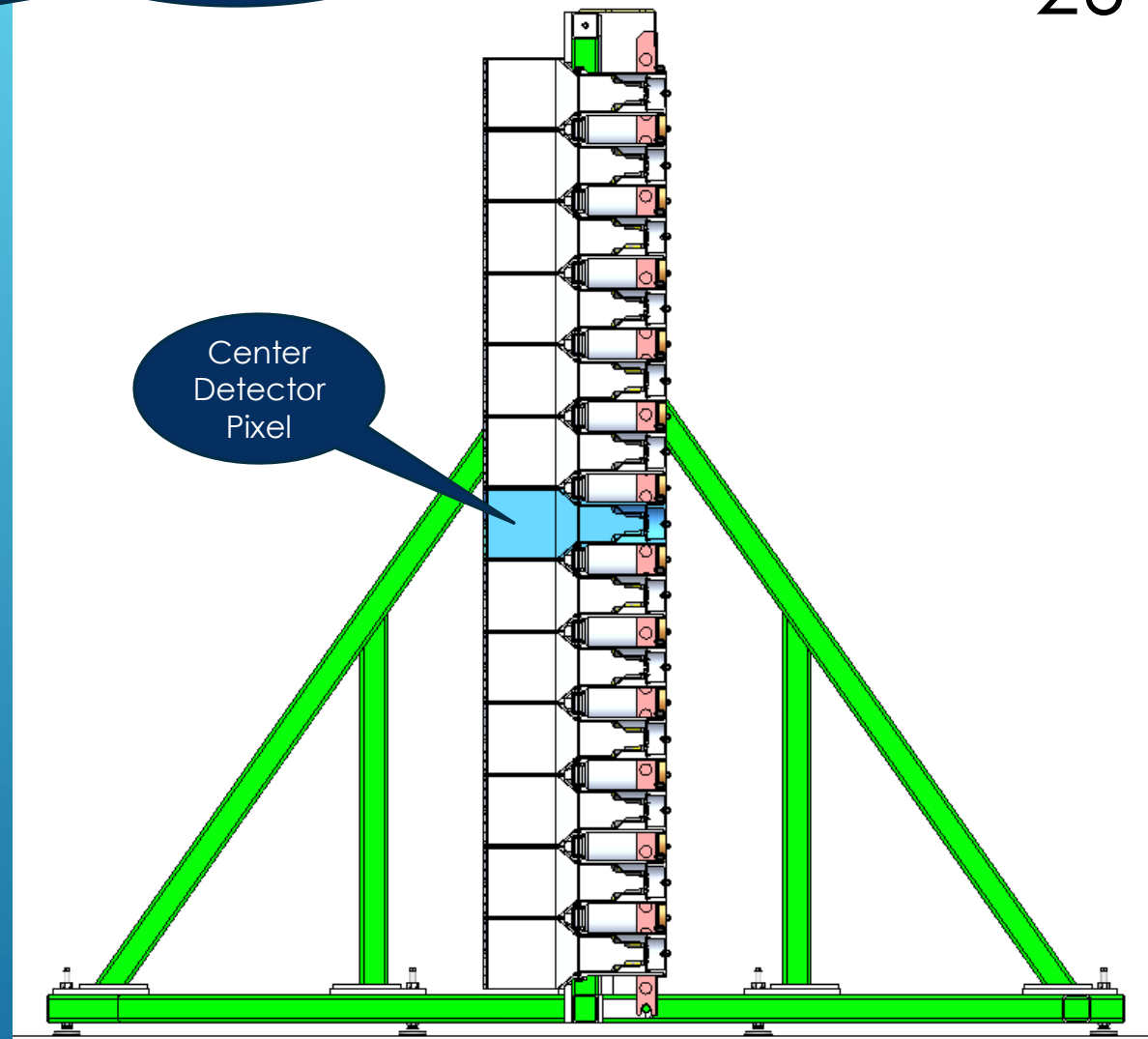
- 1" plate will be sectioned in order to fit in the U1h or U1a shaft.
- Leveling the frame will be accomplished with adjustable pads in direct contact with the invert, or onto embedded plates.
- Embedded plates would be placed coplanar to each other and parallel to beam axis.
- Without leveling pads, the frame could also mount directly on top of the plates.

PMT Rear Support Plates ?



Mounting
screw access

Eye bolts for
cable support
To Drift Ribs



Center
Detector
Pixel

DETECTOR
CALABRATION STAND

